TI:

Configurations Part II

Unclassified

Safety & Environmental Impact is “LOW”

TI: Configurations Part II

Terminal Learning Objective

Action:

Given schematic diagram identify a Common Base and Collector Amplifier and pertinent concepts of operation & troubleshooting.

Condition:

Without references.

Standard:

A minimum of 7correct answers out of 10 questions.

TI: Configurations Part II

Introduction

In the previous lesson the common Emitter Amplifier was covered, it is a Power Amplifier. This lesson will cover the amplifiers for Voltage & Current.

TI: Configurations Part II

Common Base Amplifier; CB Amp, PC 32, Characteristics.

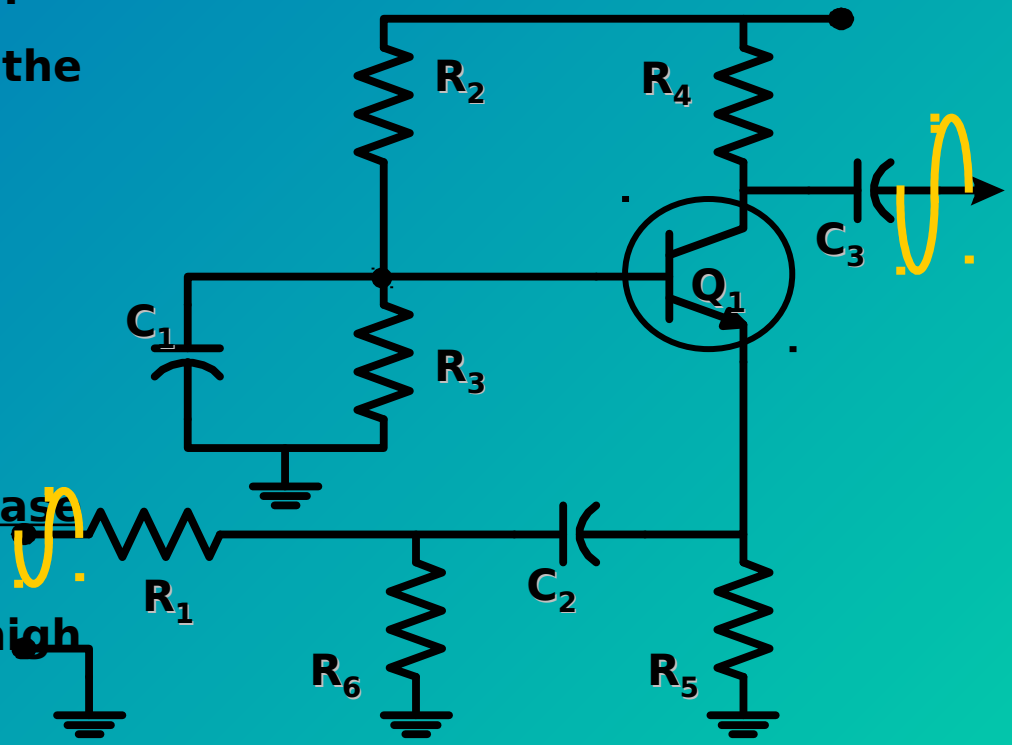
1. Input is on the Emitter.
2. Output is on the Collector.
3. Voltage Amplifier.

[E is >1] [I is <1]

V I P

B C E

4. Output signal is <u>in phase</u> w/ the input signal.
5. Operates well w/high frequencies.
6. Low input impedance.
7. High output impedance.



Circuits

TI: Configurations Part II

Common Base Amplifier; CB Amp, PC 32, Component ID

R2 & 3:

DC Base Biasing Voltage Divider.

R1 & 6:

AC Voltage Divider, establishes AC input amplitude.

C2 & 3:

Input & Output coupling Caps.

C1:

Degeneration/bypass Cap, Keeps Dc @ a constant level.

R5:

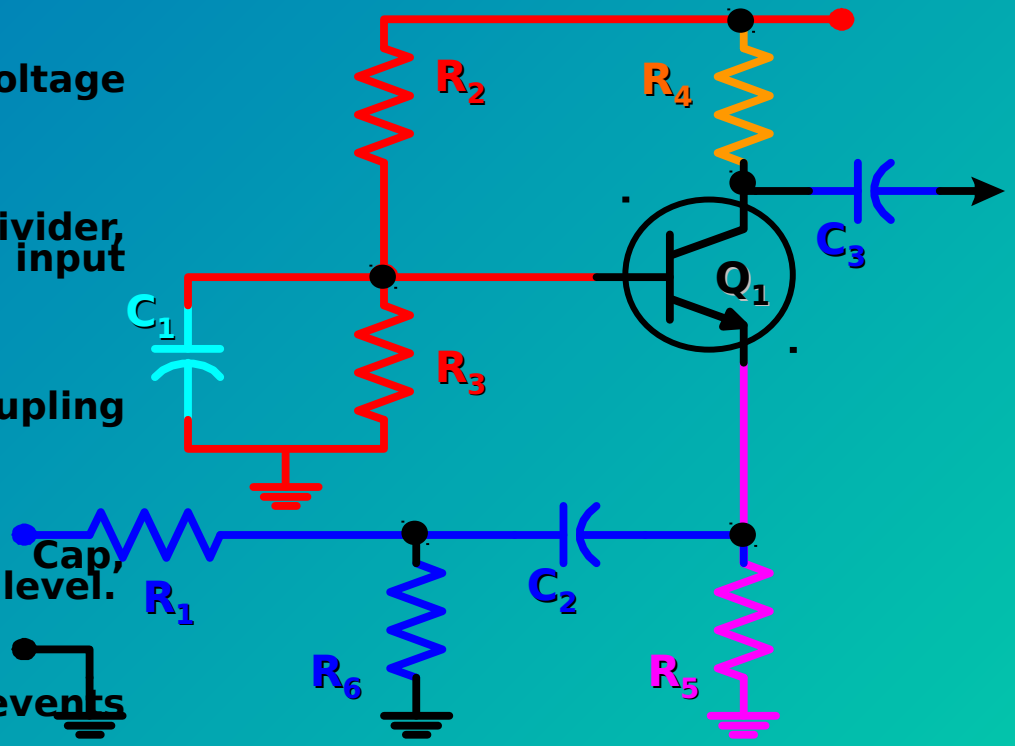
Emitter DC Bias & prevents thermal runaway.

R4:

Collector load resistor. & aids in output signal Dev.

R2, 3 & 5:

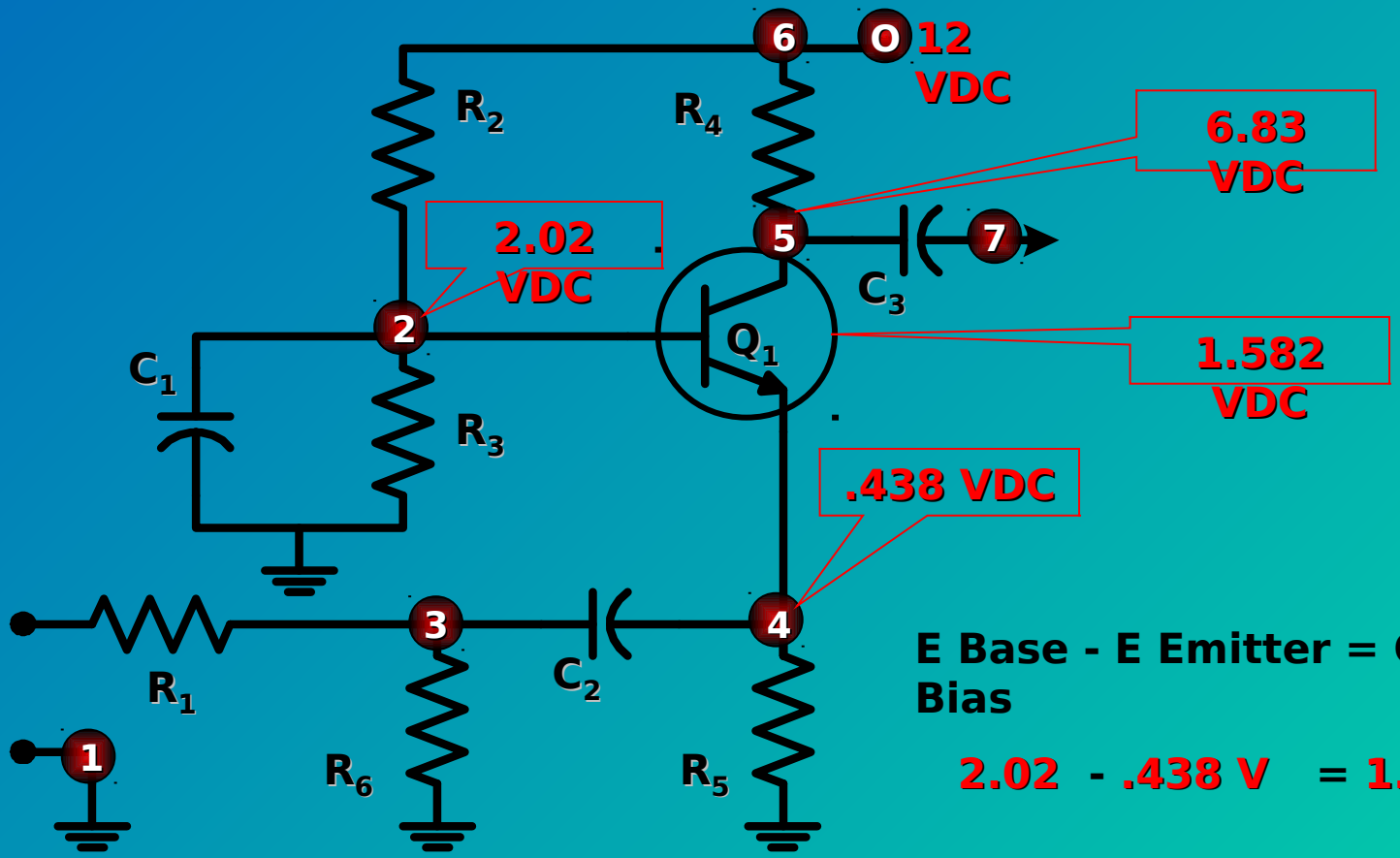
Sets Q1 Bias.



Static Bias

TI: Configurations Part II

Common Base Amplifier; PC 32, Static Bias, 12 VDC applied.



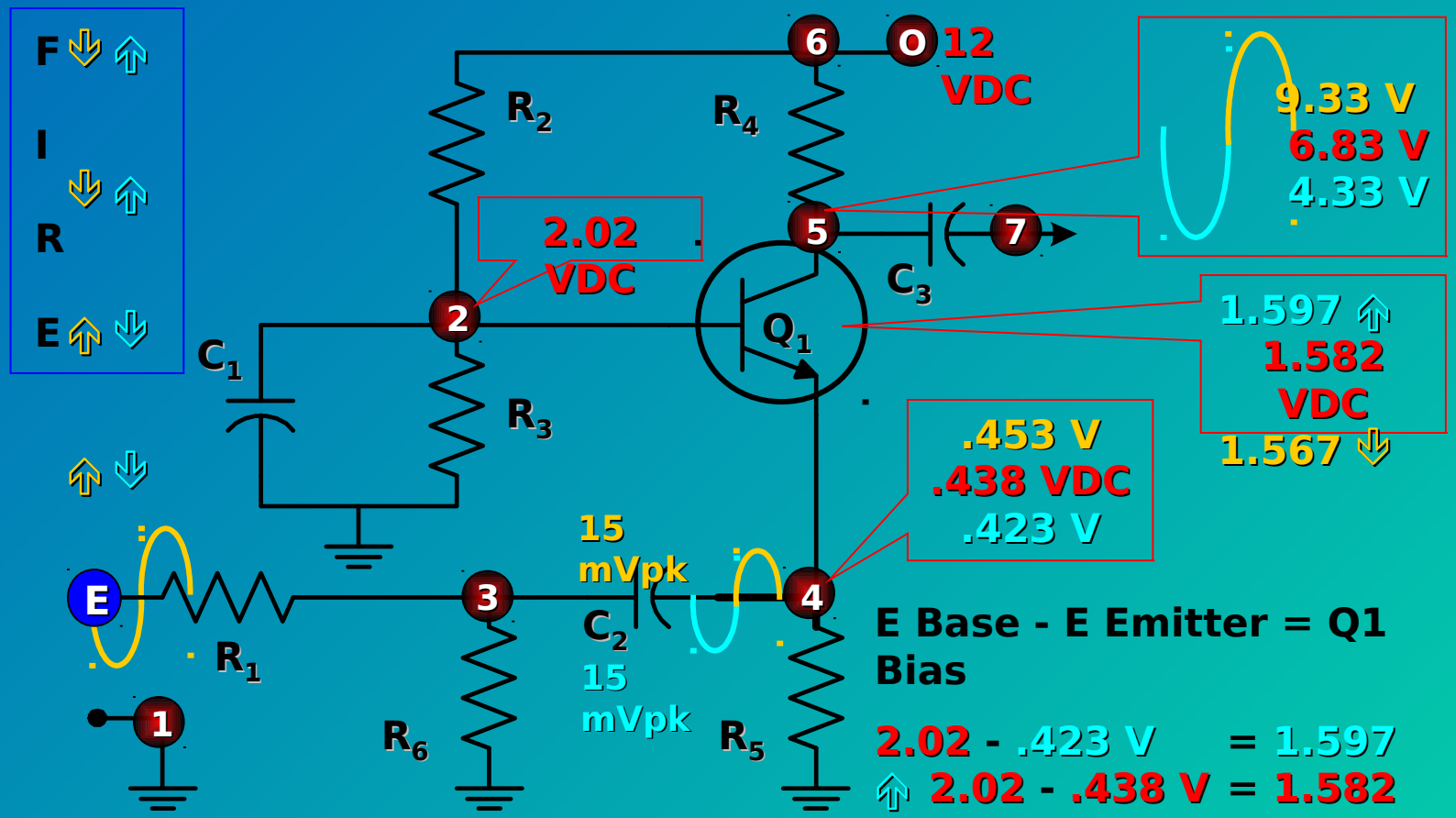
E Base - E Emitter = Q1 Bias

2.02 - .438 V = 1.582

Dynamic Bias

TI: Configurations Part II

Common Base Amplifier; PC 32, Dynamic Bias, 30 m VAC.



E Base - E Emitter = Q1 Bias

2.02 - .423 V = 1.597
⇑ 2.02 - .438 V = 1.582
2.02 - .453 V = 1.567
⇓

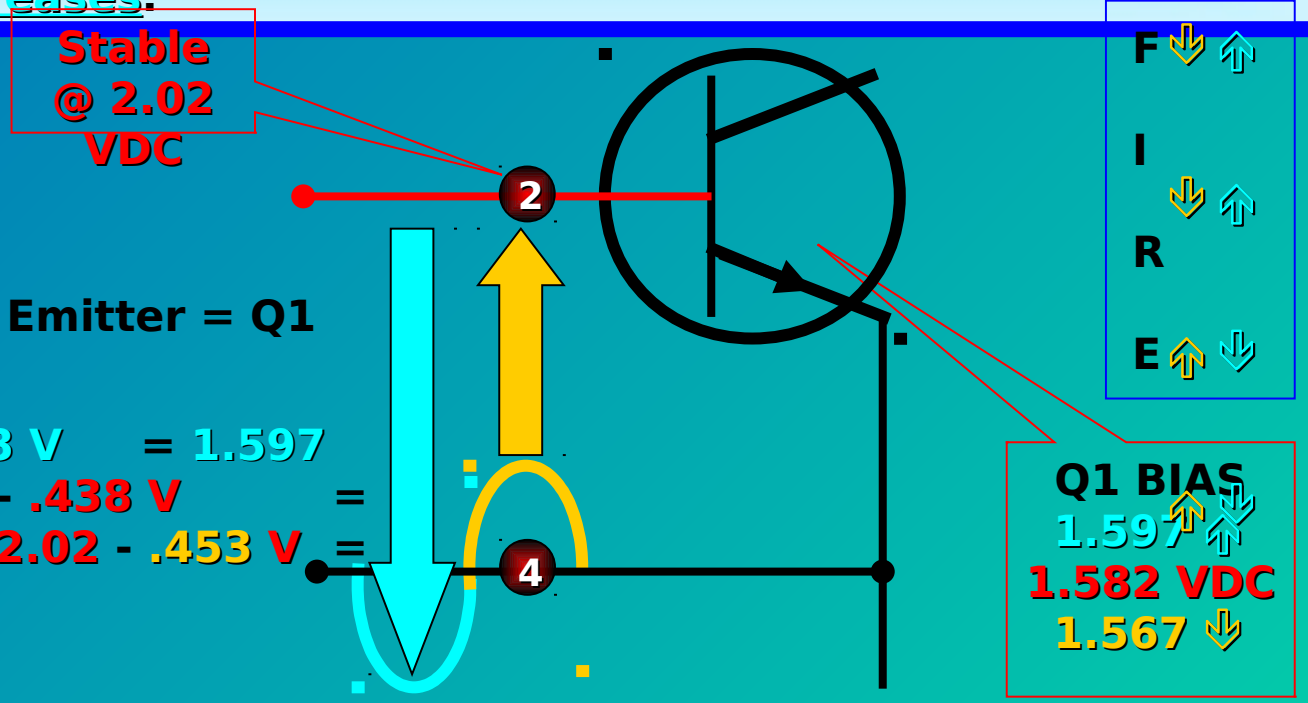
Concept

TI: Configurations Part II

CB Concept:

As the Positive Alternation is applied to the Emitter the difference between the Base & the Emitter, [Q1 bias], Decreases.

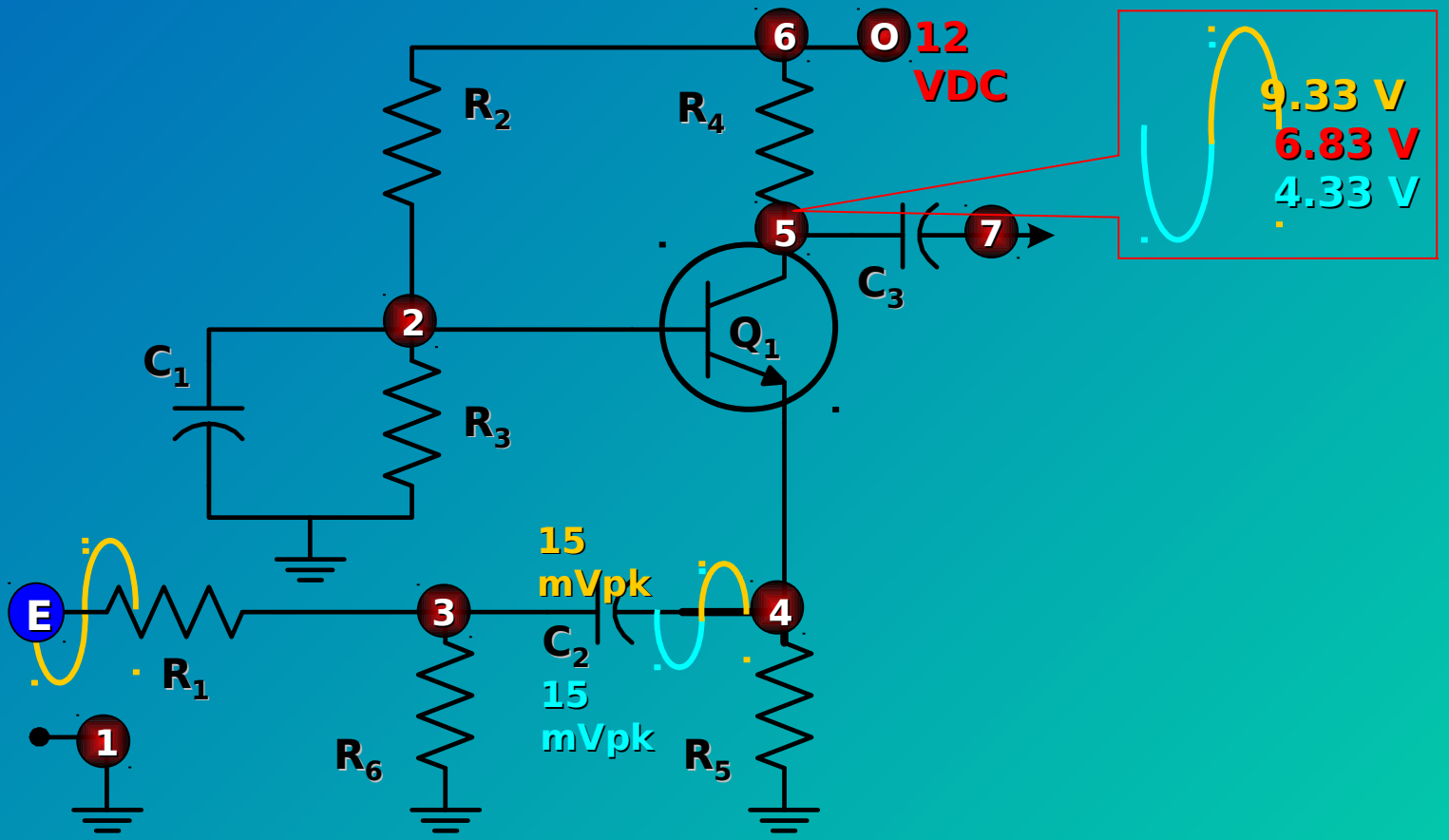
As the Negative Alternation is applied to the Emitter the difference between the Base & the Emitter, [Q1 bias], Increases.



Gain

TI: Configurations Part II

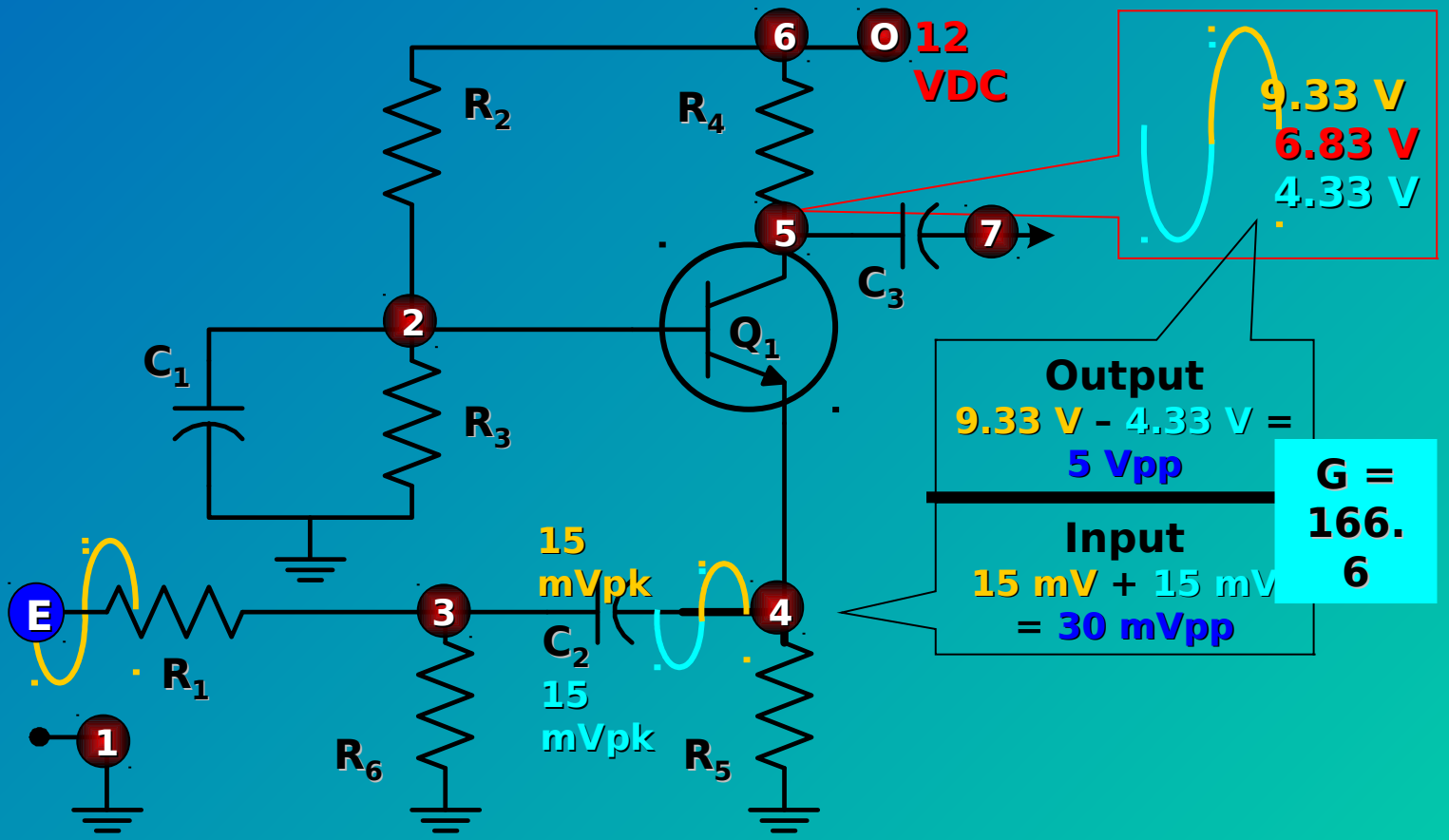
Common Base Amplifier: Calculate Gain.



Answer

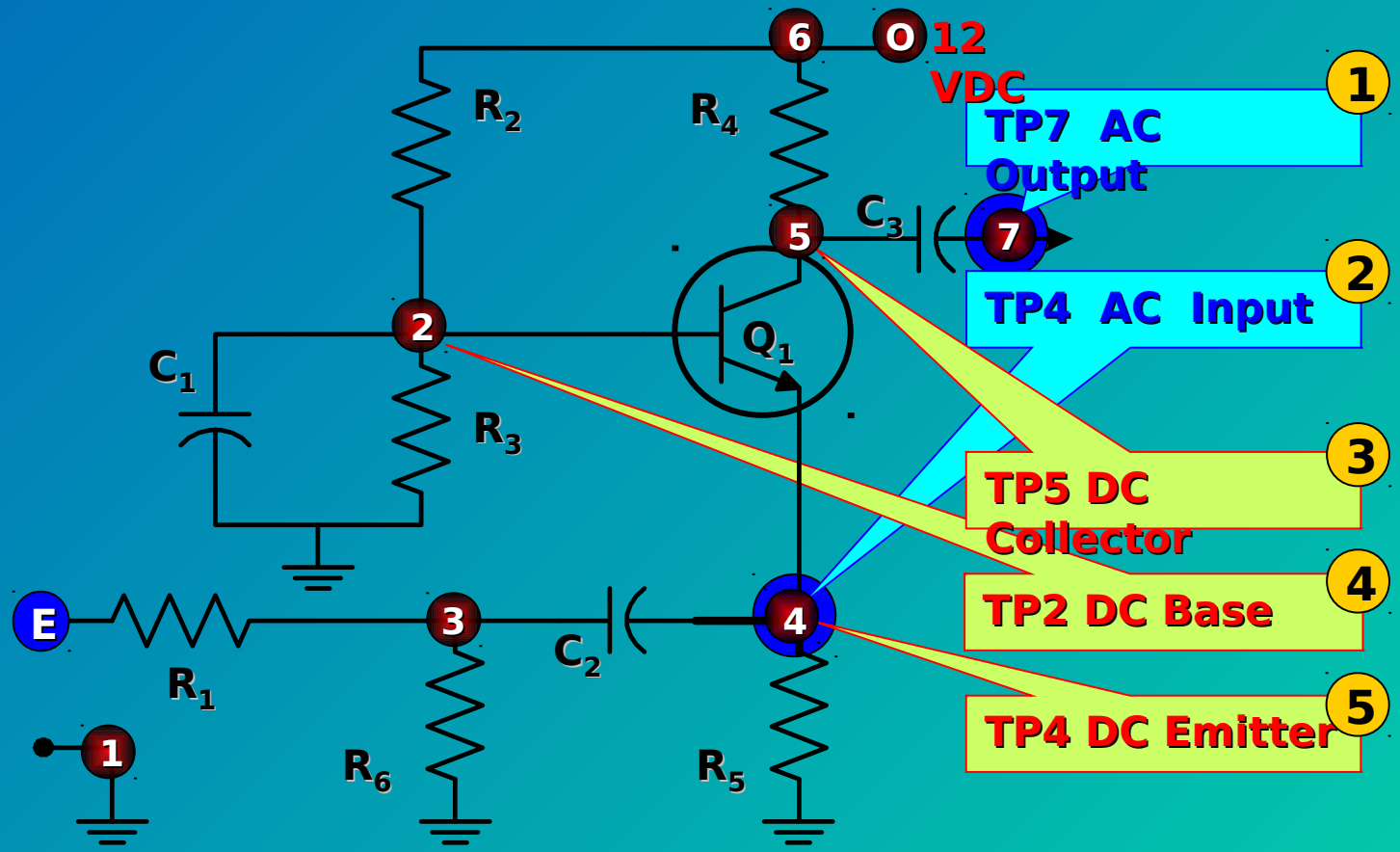
TI: Configurations Part II

Common Base Amplifier: Calculated Gain.



TI: Configurations Part II

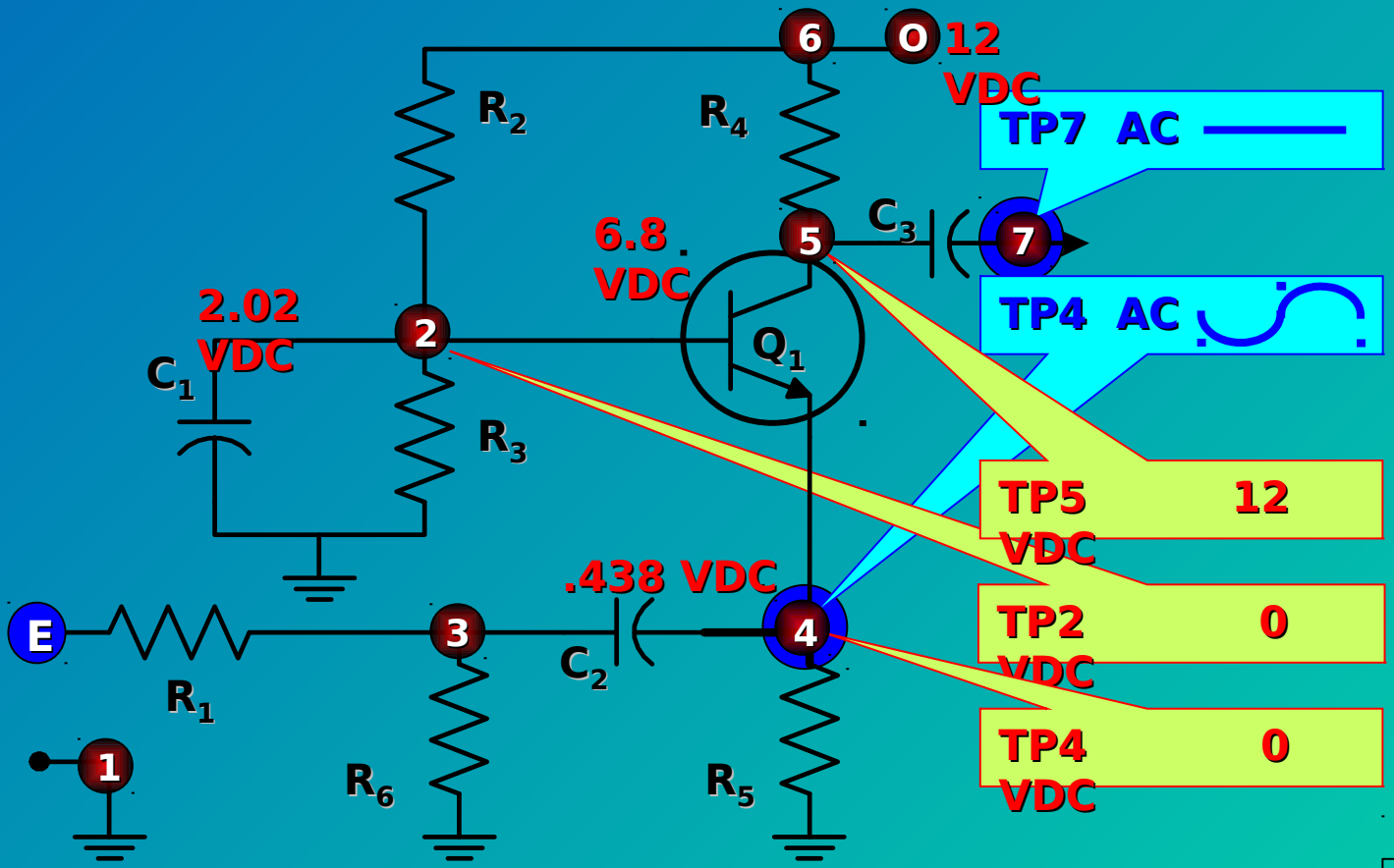
Common Base Amplifier: Troubleshooting sequence.



Challeng e 1

TI: Configurations Part II

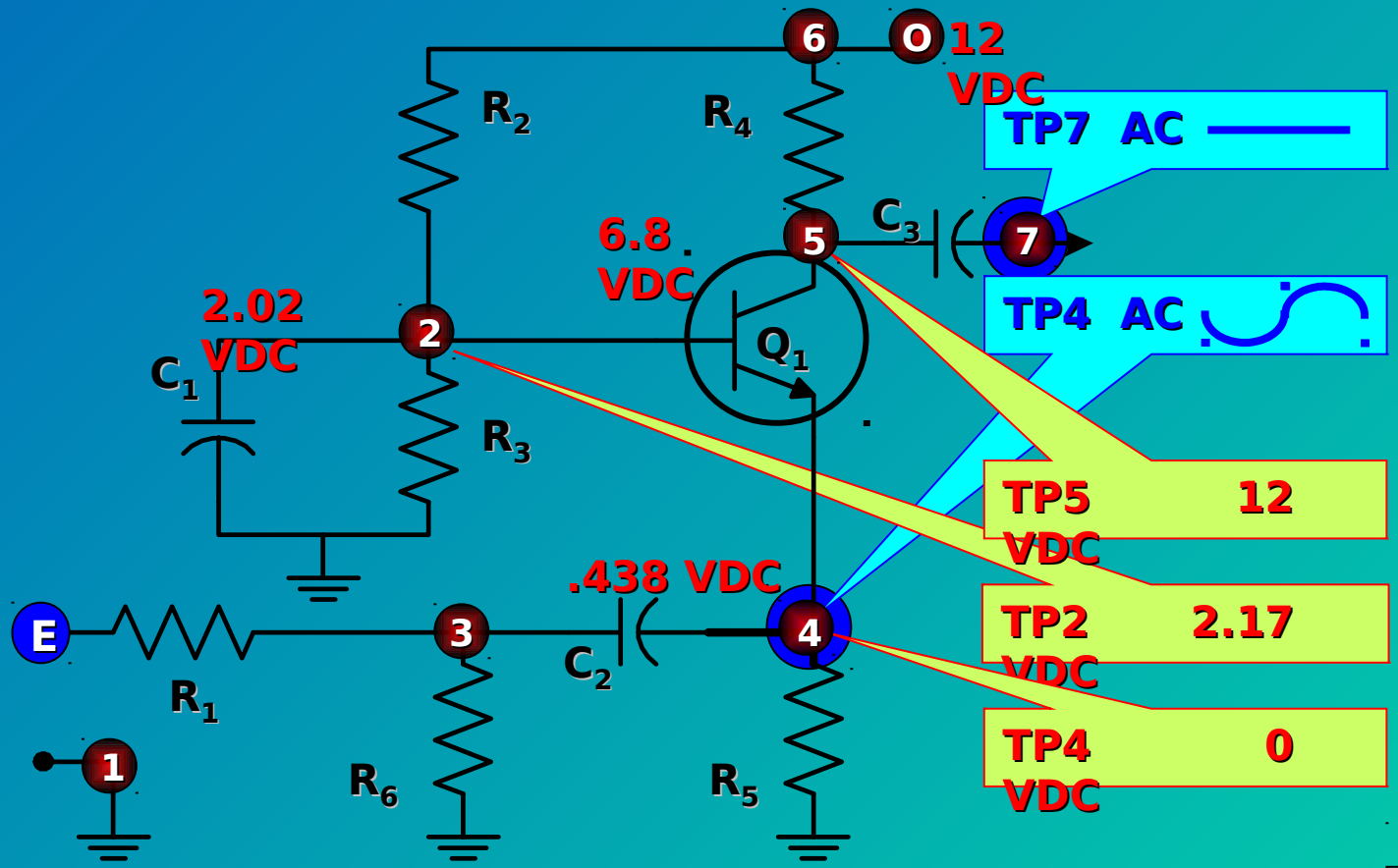
Common Base Amplifier: Troubleshooting.



Challenge 2

TI: Configurations Part II

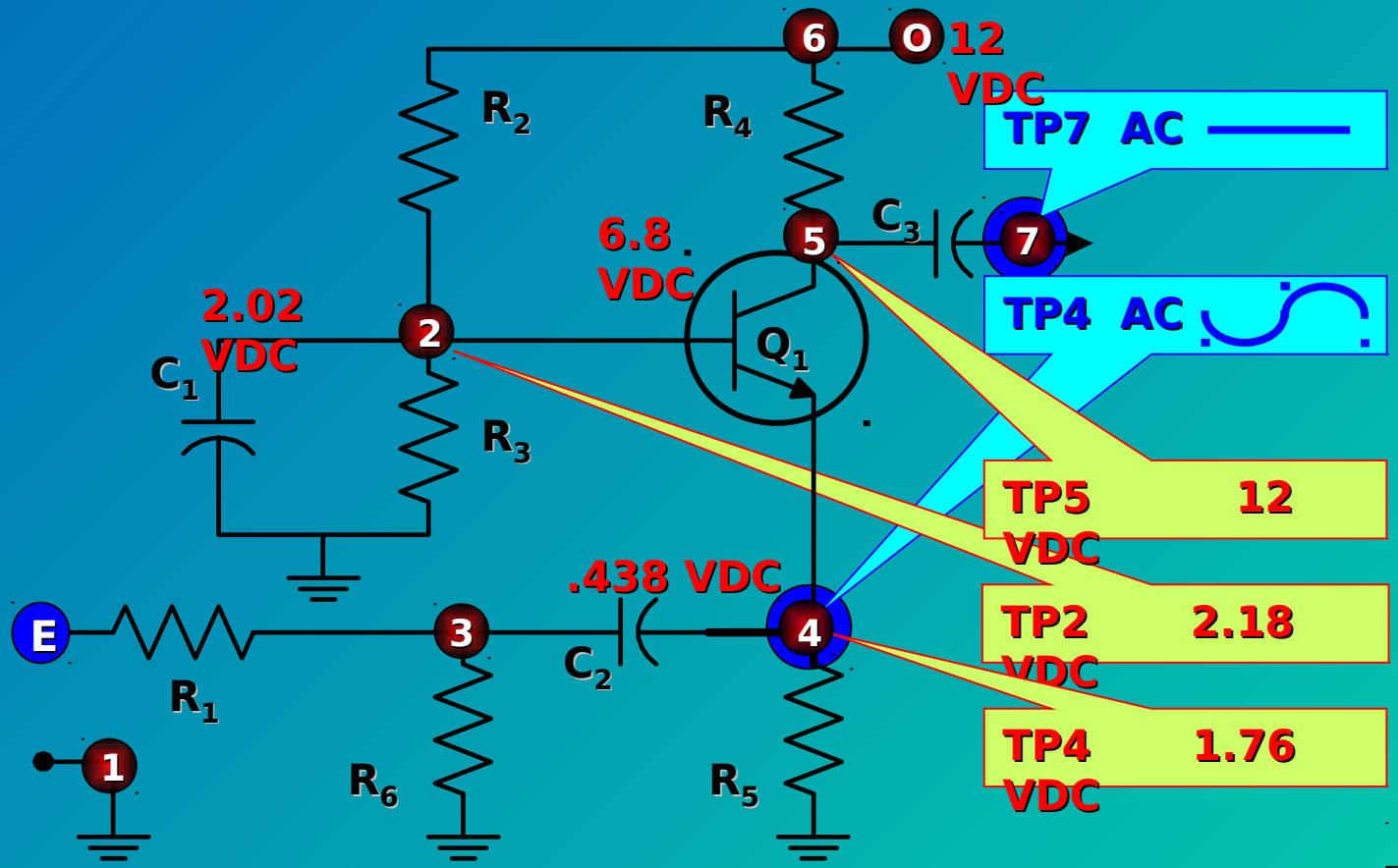
Common Base Amplifier: Troubleshooting.



Challenge 3

TI: Configurations Part II

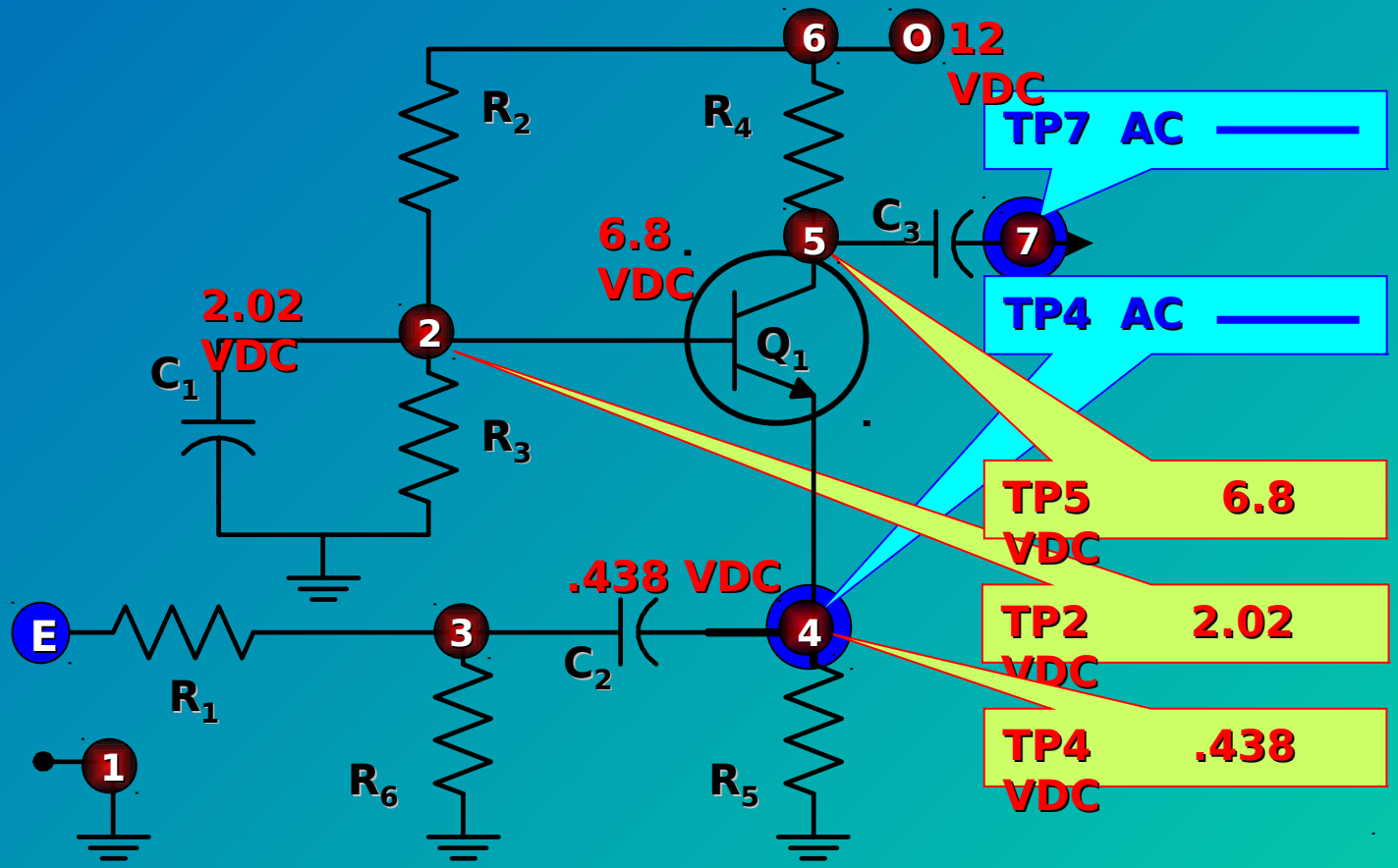
Common Base Amplifier: Troubleshooting.



Challenge 4

TI: Configurations Part II

Common Base Amplifier: Troubleshooting.



Common Collector

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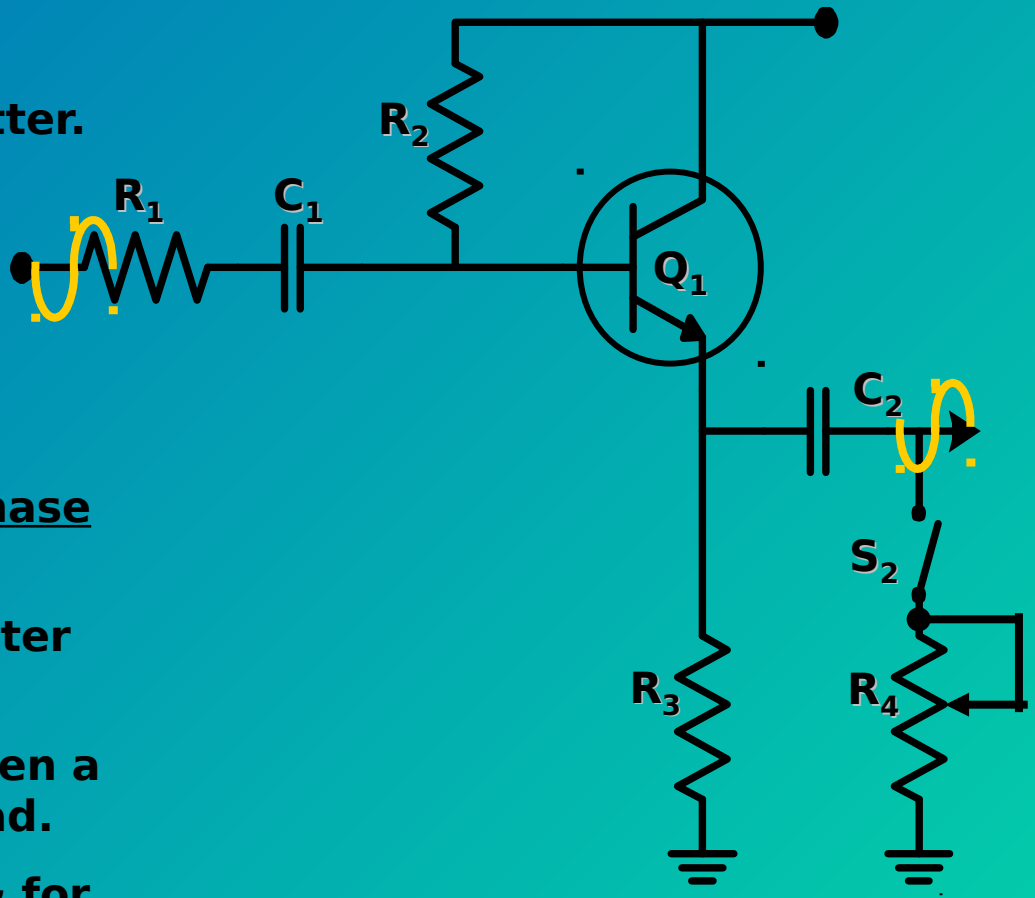
Common Collector Amplifier: CC Amp, PC 31, Characteristics.

1. Input is on the Base.
2. Output is on the Emitter.
3. Current Amplifier.

   [I is > 1] [E is < 1]

V	I	P
B	C	E

4. Output signal is <u>in phase</u> w/ the input signal.
5. Referred to as a Emitter Follower.
6. Use as Buffers between a primary Ckt & the load.
7. Used as Regulators & for Impedance matching.



TI: Configurations Part II

Common Collector Amplifier: CC Amp, PC 31, Circuits.

R1:

AC, Establishes the amplitude of the input signal.

R2:

Establishes DC Base Bias for Q1.

C1 & 2:

Input & Output coupling Caps.

R3:

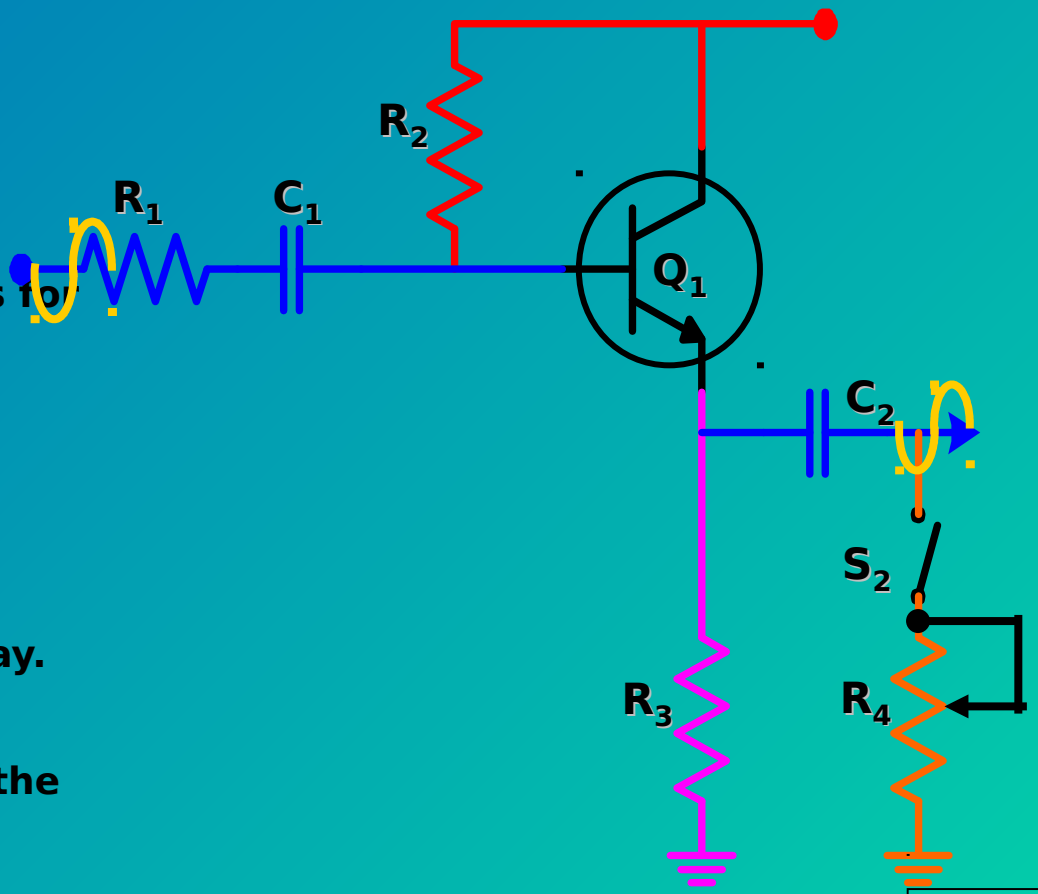
Emitter Load, DC Bias & prevents thermal runaway.

R4:

Adjust the amplitude of the output.

R2, 3:

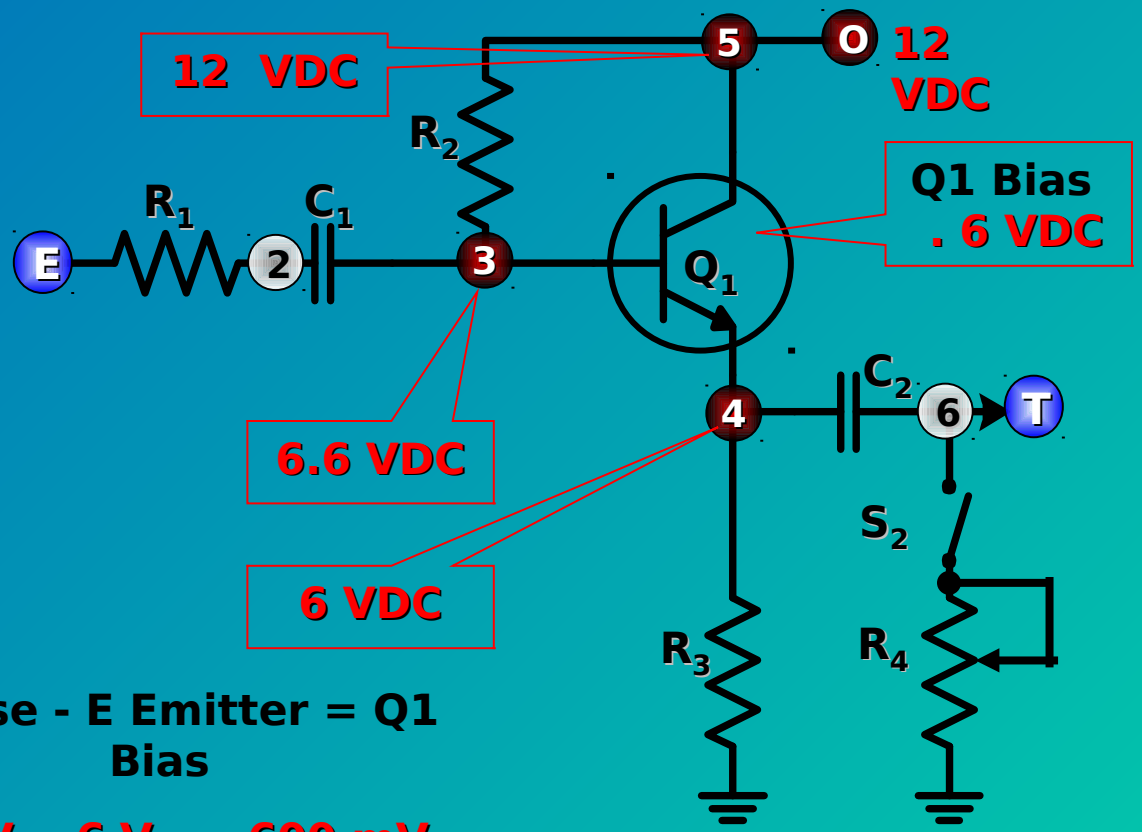
Sets Q1 Bias.



Static Bias

TI: Configurations Part II

C C Amp: PC 31, Static Bias, 12 VDC, Applied.



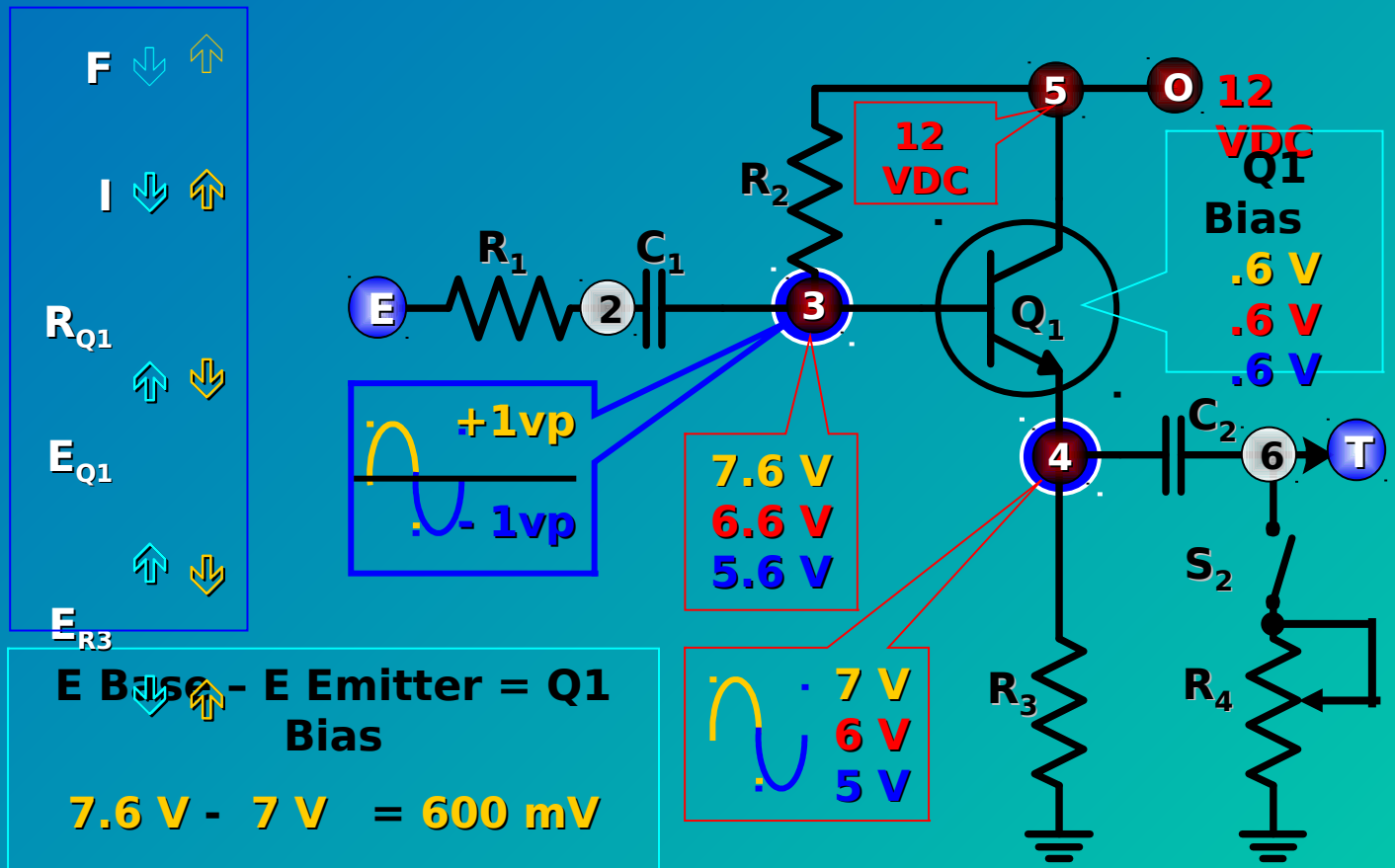
E Base - E Emitter = Q1 Bias

6.6 V - 6 V = 600 mV

Dynamic Bias

TI: Configurations Part II

C C Amp: PC 31, Dynamic Bias, 2 V P-P Applied.



E Base – E Emitter = Q1 Bias

7.6 V - 7 V = 600 mV

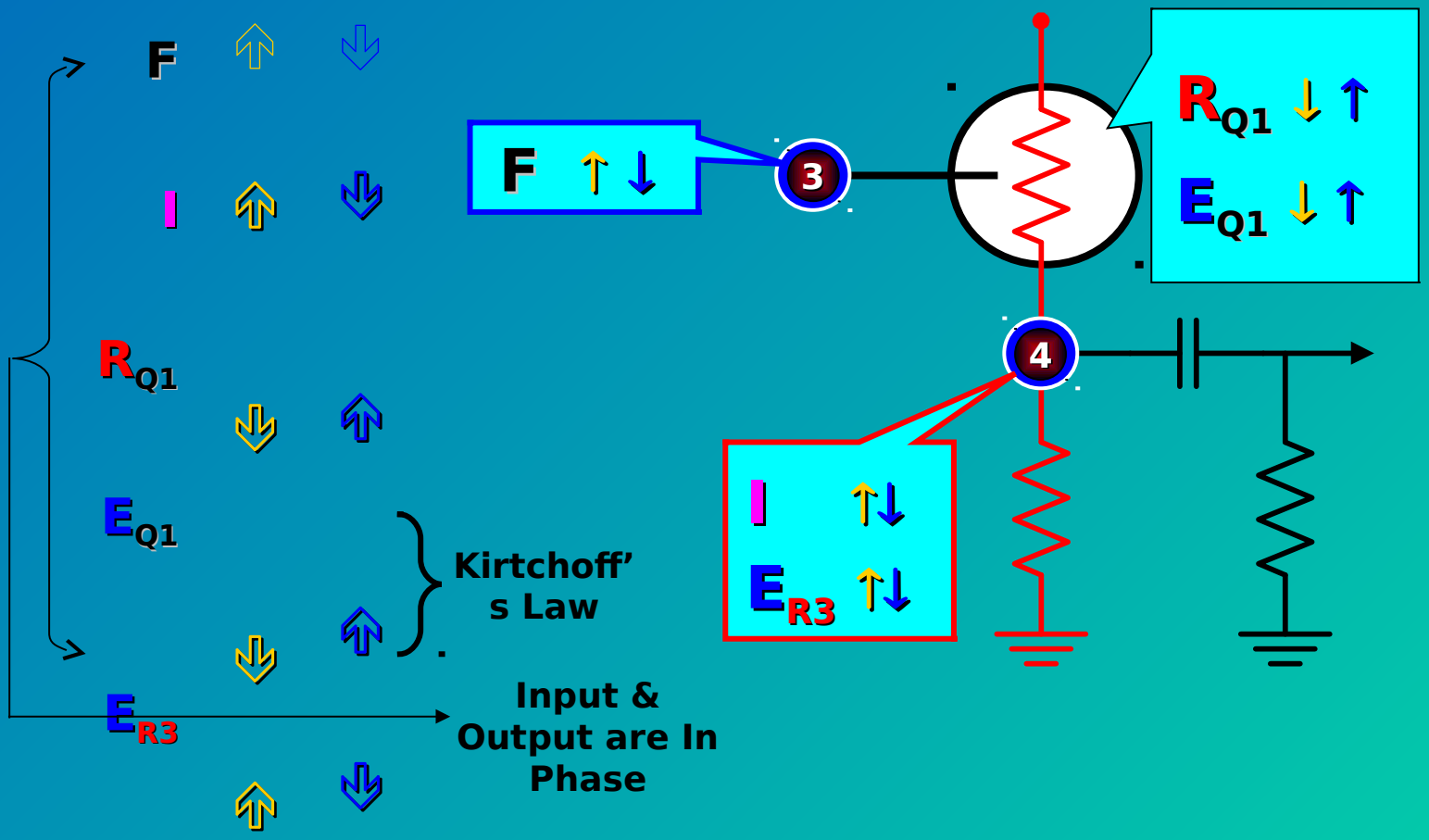
6.6 V - 6 V = 600 mV

5.6 V - 5 V = 600 mV

Concept

TI: Configurations Part II

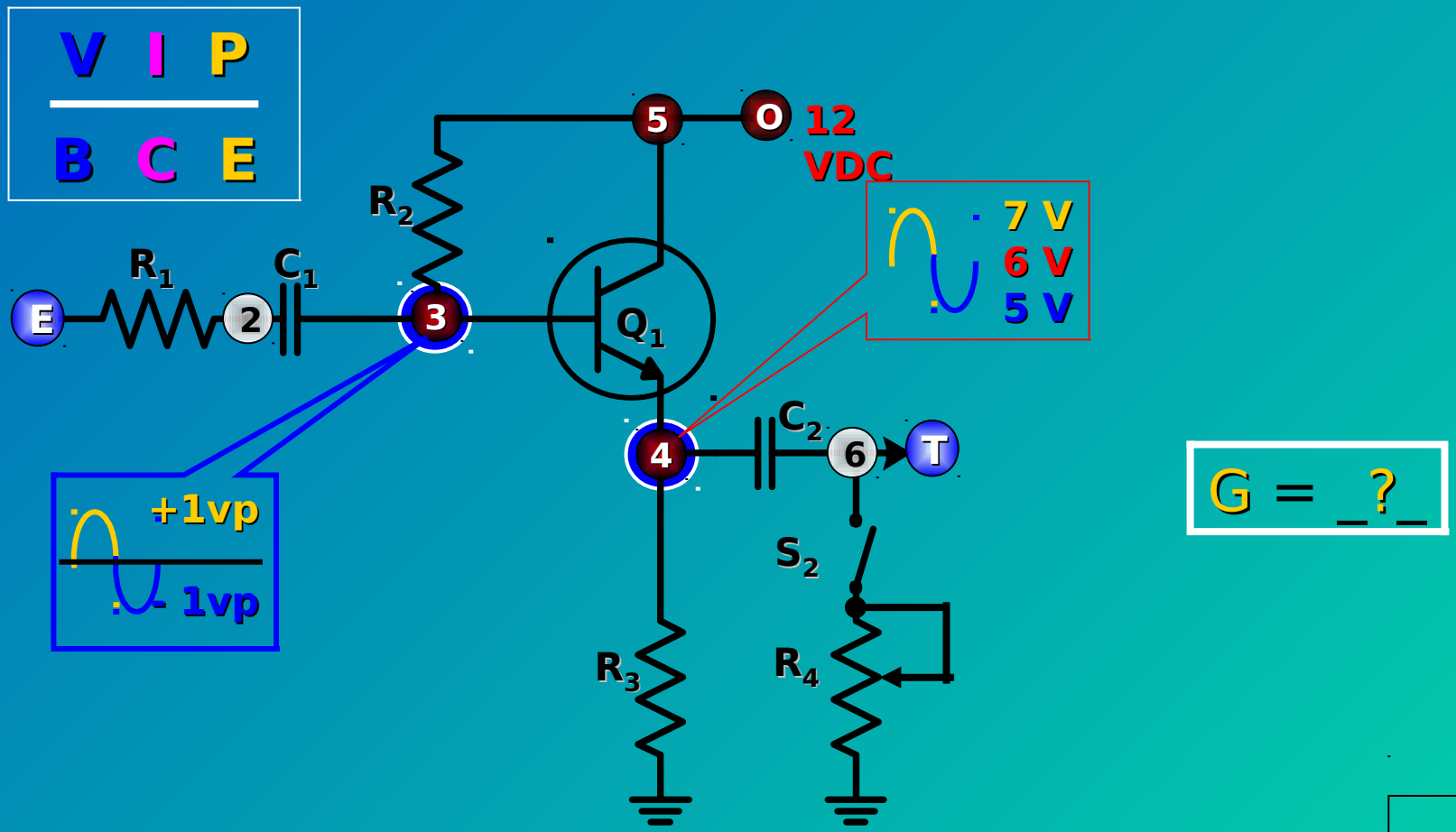
C C Amp PC 31: Operational Concepts.



Gain

TI: Configurations Part II

C C Amp PC 31: Gain, What is the Gain ?.



G = _?_

Gain Answer

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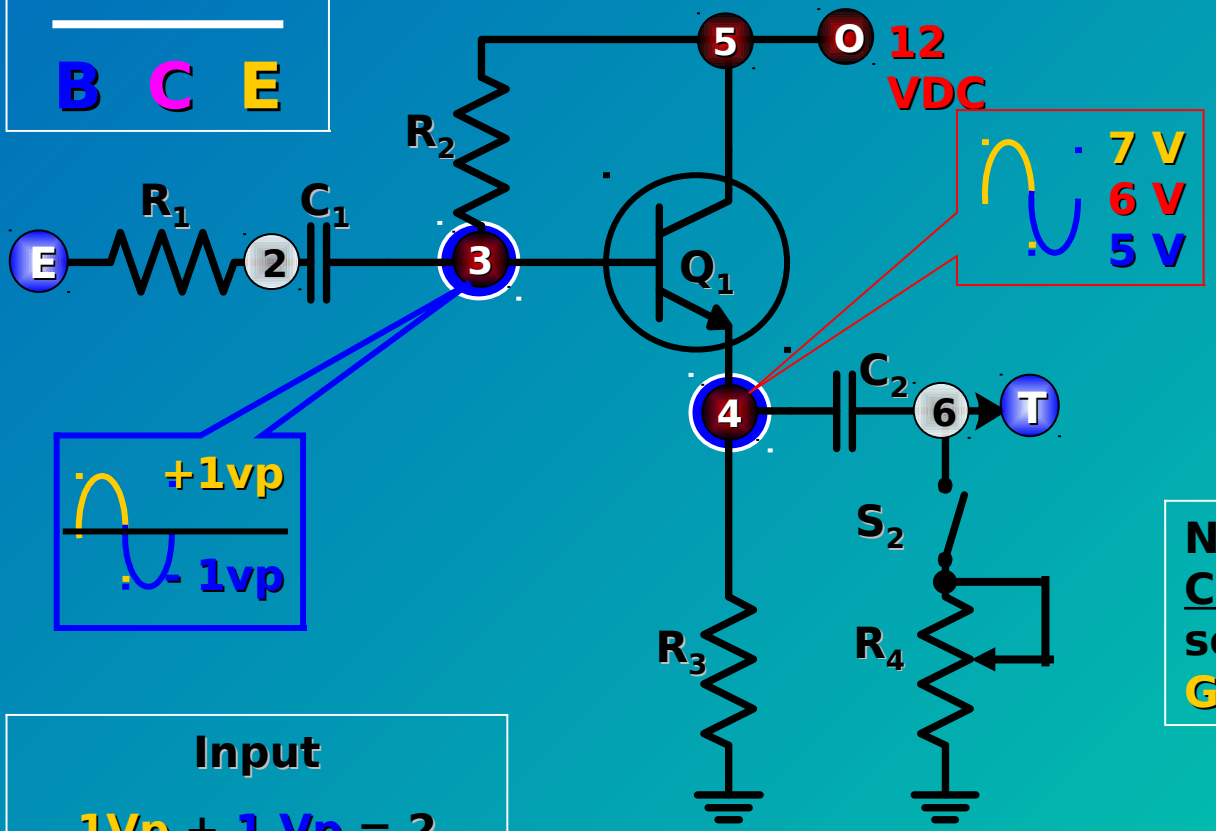
C C Amp: PC 31, Gain, Gain calculated ?.

V I P

B C E



Output

7 V – 5 V = 2 Vpp

Output = 2Vpp

Input = 2Vpp

G = 1

Input

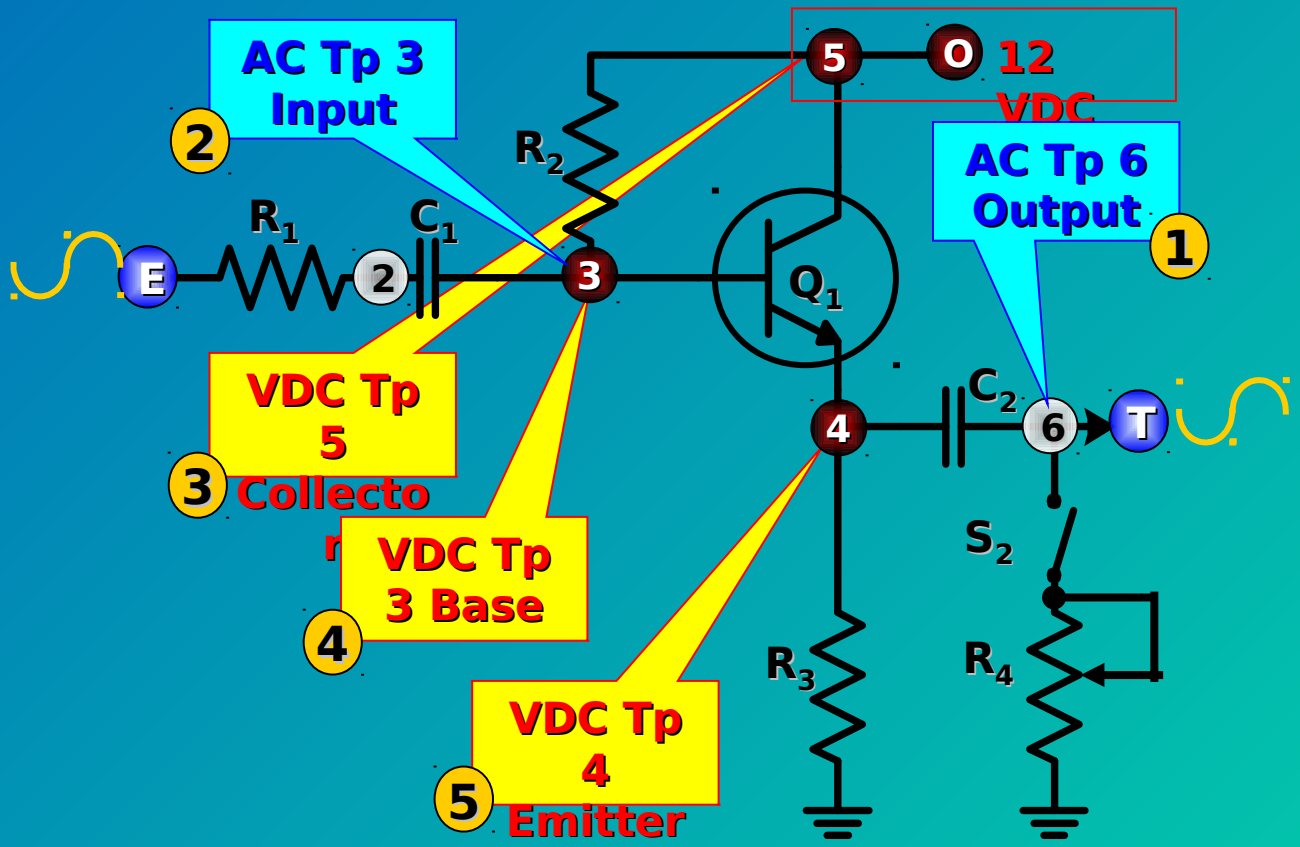
1Vp + 1 Vp = 2 Vpp

Note: A CC is a <u>Current Amplifier</u> so the Voltage Gain will be ≤ 1.

Troubleshooting

TI: Configurations Part II

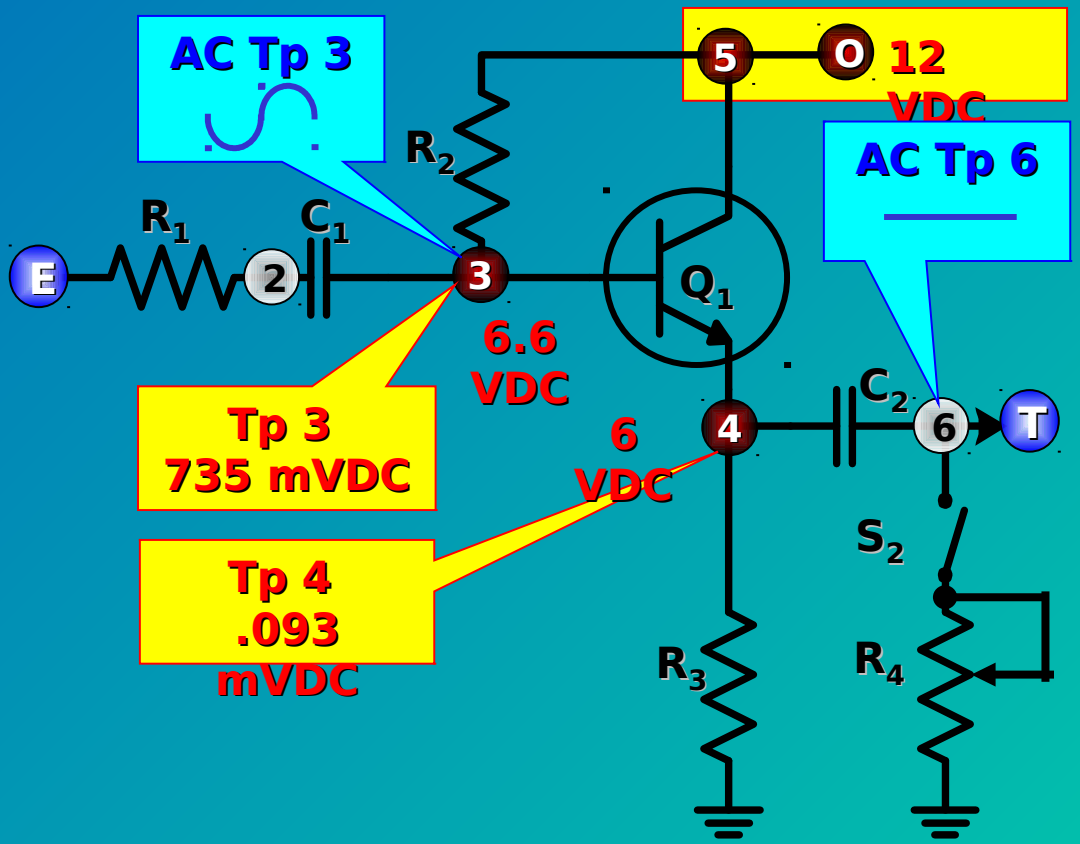
C C Amp PC 31: Troubleshooting Sequence.



Challenge 1

TI: Configurations Part II

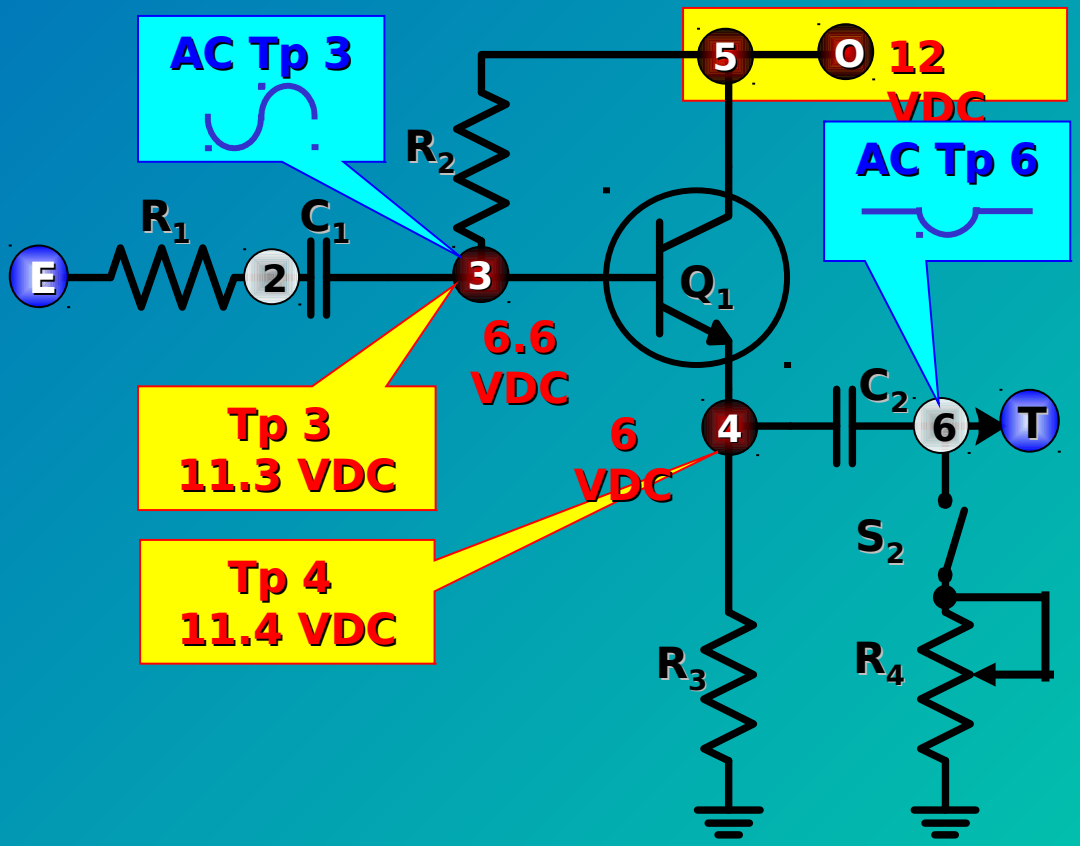
C C Amp PC 31: Troubleshooting Challenge I.



Challenge 2

TI: Configurations Part II

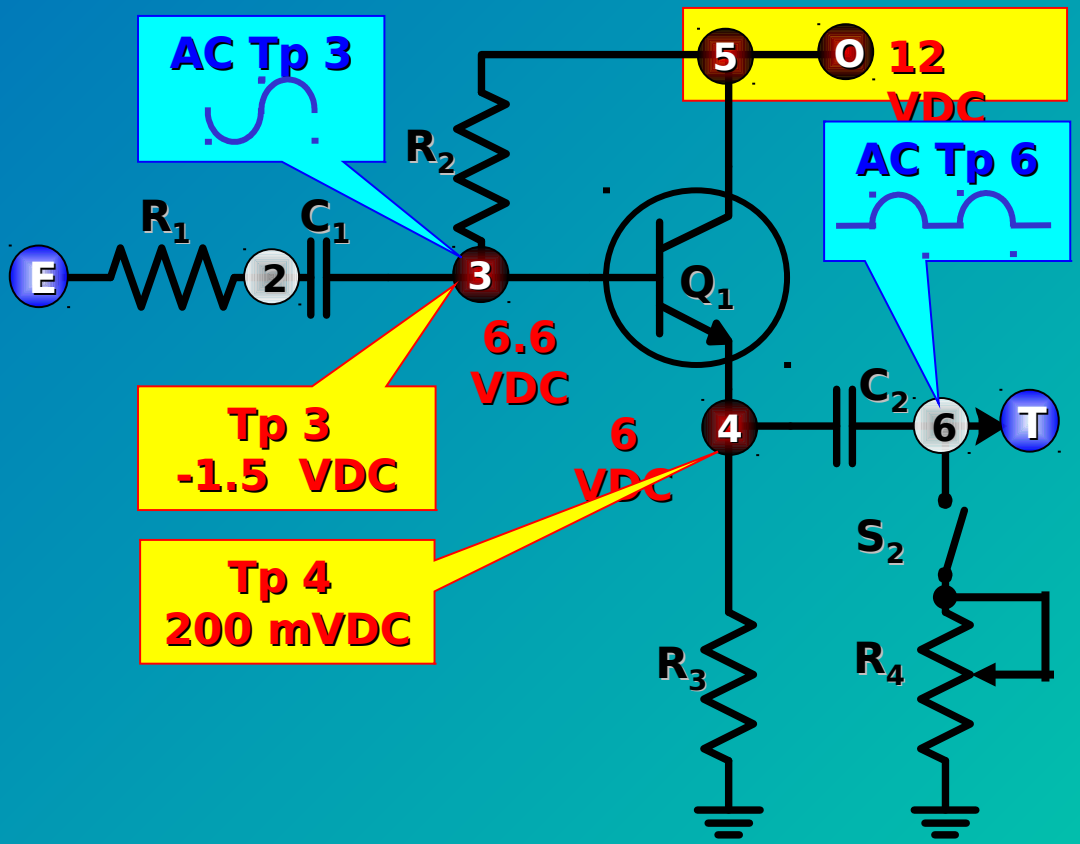
C C Amp PC 31: Troubleshooting Challenge II.



Challenge 3

TI: Configurations Part II

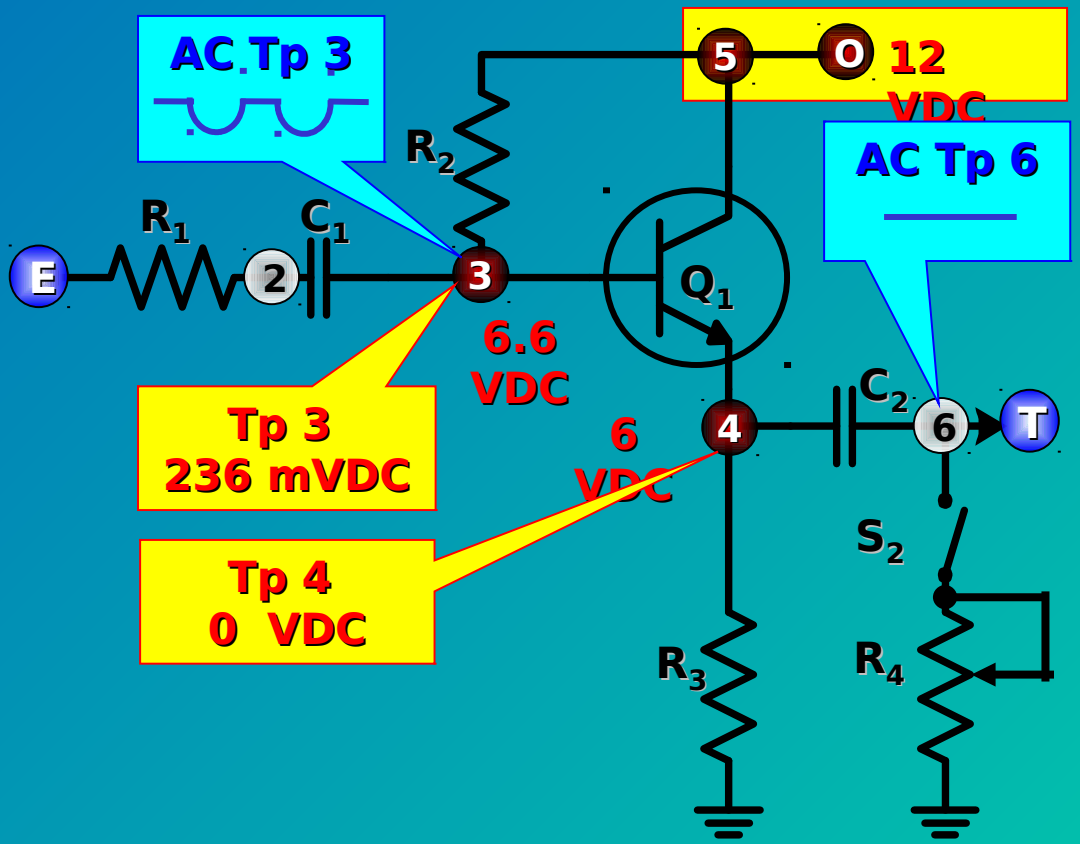
C C Amp PC 31: Troubleshooting Challenge III.



Challenge 4

TI: Configurations Part II

C C Amp PC 31: Troubleshooting Challenge IV.



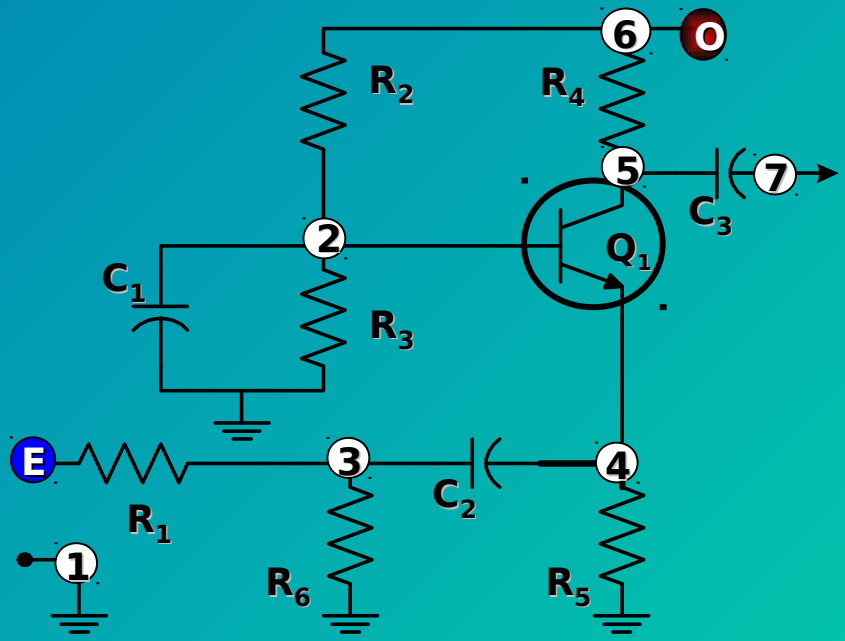
TI: Configurations Part II

Review Questions: 1-2 . Reference CB Amp PC 32;

1. What is the input & output signal phase relationship of this Ckt? _____

2. How would this Ckt be identified as a CB amplifier <u>operationally</u>?

   _____



Answers 1-2

TI: Configurations Part II

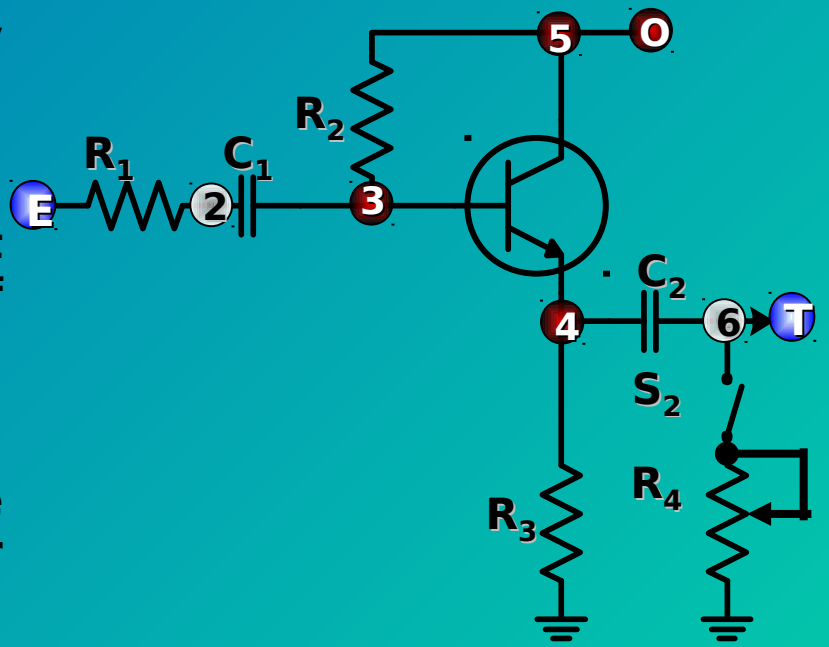
Review Questions: 3 – 5. Reference CC Amp PC 31;

3. What does this Ckt amplify best? _____

4. What is the input & output signal phase relationship of this Ckt? _____

5. How would this Ckt be identified as a CC amplifier <u>operationally</u>?

_____



Answers 3-5

TI: Configurations Part II

Review Questions: 6-11 .

6. An amplifier has a small signal applied to its base & a larger output, 180° out of phase, on its collector. What configuration is this amplifier? _____ _____

7. An amplifier has a small signal applied to its Emitter. And a larger signal on the collector, in phase w/ the the Emitter signal. What configuration is this amplifier?_____ _____

8. What is another name for the CC amplifier? ____ _____

9. The output signal on the emitter of a properly functioning amplifier is smaller than the input signal on its base. What configuration is this amplifier? _____ _____

10. Which amplifier is good for current gain or for Impedance matching because of its high input impedance, but will never produce an output signal larger than the input? _____

11. Which Amp has good Voltage & Current Gain & the best Power gain ? _____ _____

Answer s 6-11

TI: Configurations Part II

Review Questions: 12 -13. Refer to; PC 32, CB Amp

12. There is no output signal @ TP7, TP4 has a good input Signal. The DC Voltages present are; TP5 is 12VDC, TP2 is .78VDC & TP4 is .16 VDC. What is the Malfunction?

    a. Emitter Q1 open

    b. Base Q1 open

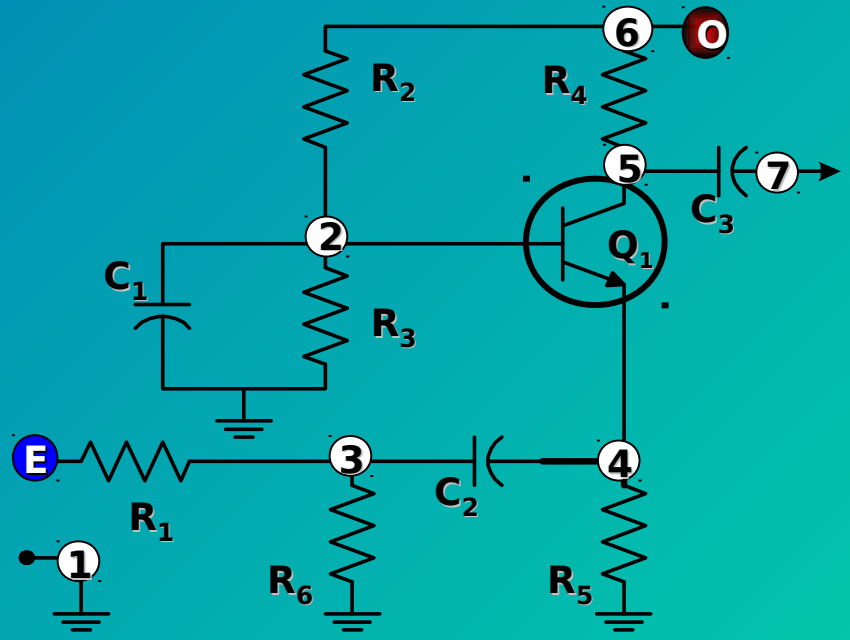
    c. Collector of Q1 open

    d. R2 open

13. There is no signal @ TP5. The input signal is normal. The following DC Voltages are present; TP5 is 12VDC, TP2 is 0 V & TP4 is 0 V. What is the Malfunction?

    a. R4 open c. C2 open

    b. R5 open d. R2 open



Answers 12- 13

TI: Configurations Part II

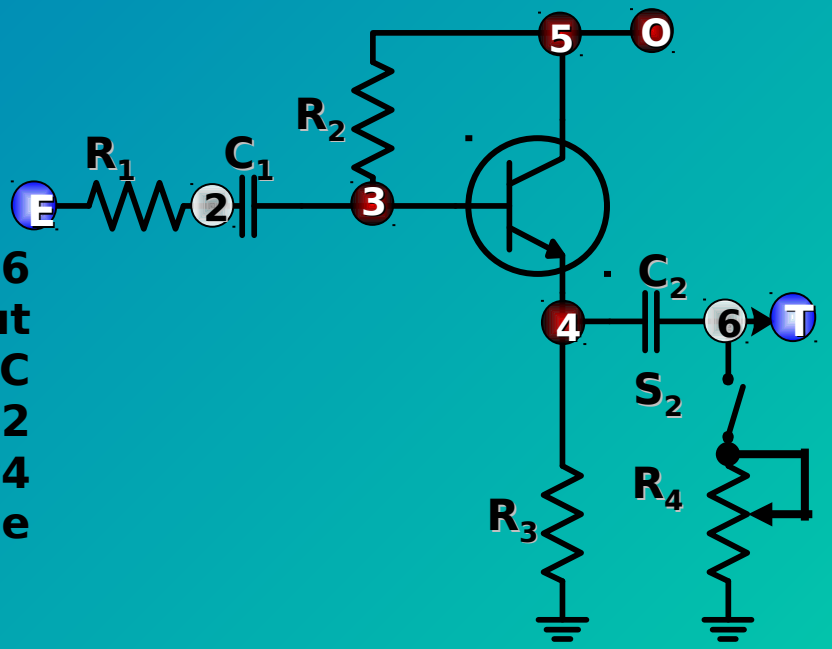
Review Questions: 14 -15. Refer to; PC 31, CC Amp

14. The following voltages were measured. TP5 is 12 V, TP3 is 6.6 V & TP4 is 6 VDC. What is the level of conduction of Q1?

_____ _____

15. The output signal @ TP6 is ⌒⌒ The input signal is normal. DC Voltages @ TP5 is 12 VDC, TP3 is -1.5 V & TP4 is .2 V. What is the Malfunction?

___ _____



Answers 14- 15

TI: Configurations Part II

Summary & Review;

Lesson Test:

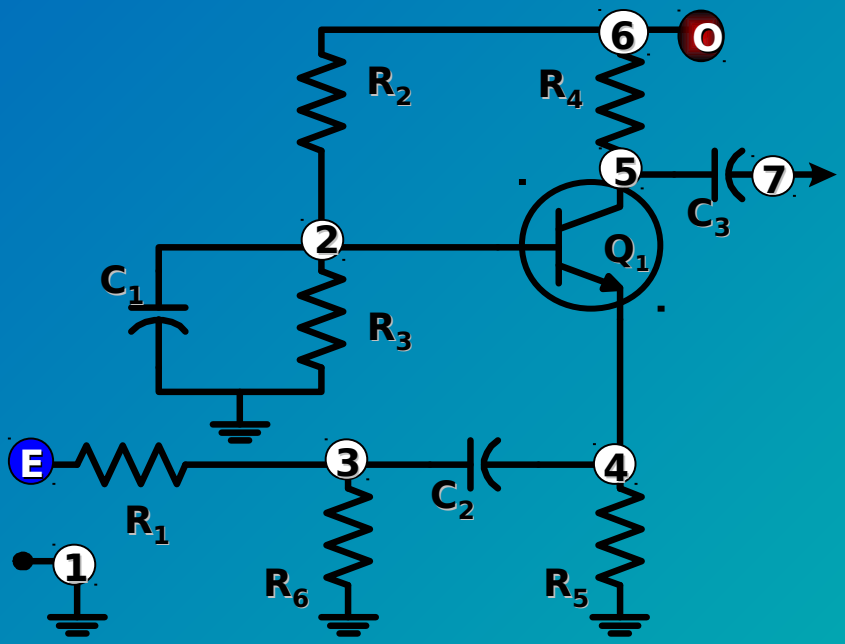
Standard: 10 Questions W/in 20 Minutes.
7 Correct answers, Minimum.

Reference: None.

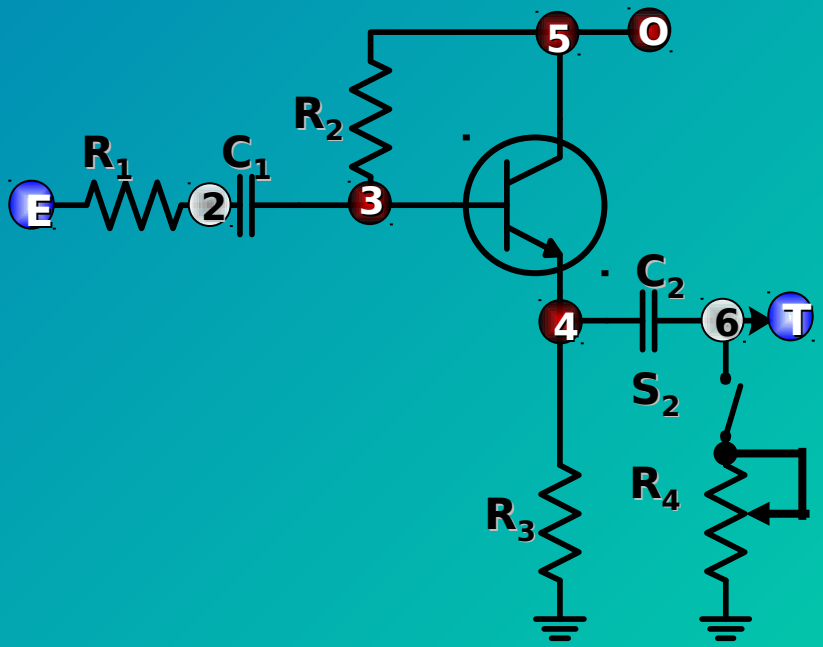
PC 31 & 32
Schematic

TI: Configurations Part II

PC 32, Common Base & PC 31, Common Collector Amplifier:

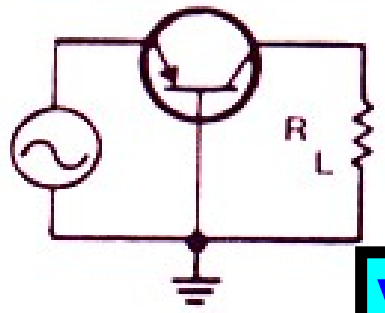
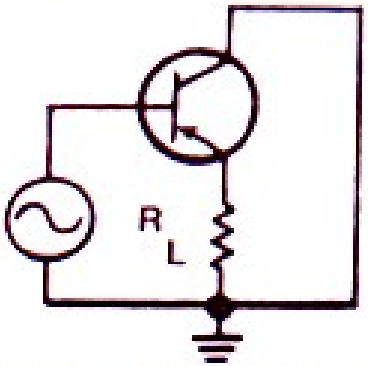
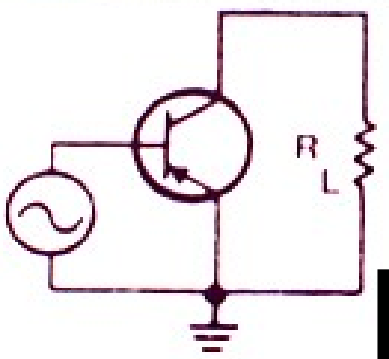


PC 32, CB Amp



PC 31, CC Amp

TI: Configurations Part II

COMMON BASE	COMMON COLLECTOR	COMMON EMITTER
		
V	I	P
High Voltage Gain 300 Current Gain < 1 Lowest Input Impedance 30Ω Highest Output Impedance 1M Ω	High Current Gain 36 Voltage Gain < 1 Highest Input Impedance 350kΩ Low Output Impedance 500 Ω	Highest Power Gain 10,000 High Voltage Gain (300) High Current Gain (35) Input Impedance 1kΩ Output Impedance 50kΩ